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ADDRESS OF THE CHAIRMAN OF THE SOCIAL SCIENCE RESEARCH COUNCIL[1]

By Dr. EDWIN B. WILSON

HARVARD SCHOOL OF PUBLIC HEALTH

I AM very glad to greet the guests and members of the council assembling for our annual meeting in this historic building of the oldest, broadest and most distinguished learned society of our country and I have to express to the American Philosophical Society the thanks of the council for permitting us to gather here.

It was fifteen years ago come New Year's that the American Statistical Association elected me to the council. I have attended most of the fifteen annual and spring meetings since that time with pleasure and profit, and have missed the few others only for the most compelling reasons. There are some few connected with the council who have a longer record.

My experience over these fifteen years has convinced me that our constituent societies are often quite ignorant of the aims and the opportunities of the council whose regular members they elect. Some of the societies seem at times to think they are sending us representatives whose duty it is to maintain close contact between us and their societies for their benefit. This certainly is not the case. It is not necessary and indeed it is scarcely possible that the council should be of any direct and immediate use to the individual constituent societies or to their individual disciplines. Those elected by the societies are here with the opportunity of viewing social science as a whole and of determining how best to serve it.

In the past fifteen years with which I am acquainted and in the preceding five of which I have heard the council has tried to help in a number of ways. When

[1] Given at the opening session of the annual meeting, held in Philadelphia, September 17, 1942.

I first came upon the council it had large project funds to spend. The meetings of the Committee on Problems and Policy were long; the chairman of the committee had a very onerous task; the council itself met for long sessions. We took the distribution of these funds very seriously. Projects came to us from divers persons who wanted funds for research. We did not merely select the projects that seemed the best and appropriate moneys for their support. The projects were referred to standing advisory committees which examined them with primary reference to improving them with all the collective wisdom that we could bring to bear, to the end that we might support the best projects we could formulate from those submitted. The result in my opinion was that we aided projects which were far better than they had been in the form in which they were submitted to us. We performed a real service in improving social science, a far greater service than if we had merely supported the best of the projects as they came to us.

Later when project funds were no longer available we entered upon a program of planning in so-called areas of concentration—industry and trade, international relations, consumption and leisure, etc. There were perhaps eight of these large areas which we defined. To my way of thinking the aim was excellent, namely, to select important areas needing investigation, problems important irrespective of the disciplines involved and generally involving, as many if not most important problems do, more than one discipline. If only one could plan for consistent research in such areas in a connected way, bringing to bear the collected wisdom and assembled techniques of our membership and of those who would accept appointment on our advisory committees, a great service would be rendered to social science, a service which isolated individuals in different disciplines could not render any more than we as a council could render to social science research those services which are peculiarly the function of the individual investigator or the individual discipline. This program of areal planning had some successes and, as must be expected, some failures.

More recently we have dropped the areal concept as our leit-motif; it proved to be too ponderous and insufficiently adaptable. We are planning still, be the scale large or small, in spots where it seems that planning is likely to be fruitful. And we have undertaken appraisal with some interesting and important results on which Mr. Redfield reports. In a sense appraisal is the opposite of planning; it looks back and evaluates accomplishment attained or methods used, whereas planning looks forward to new results, but both are necessary to the most effective improvement of science. Appraisal and planning are more important in the social sciences than in the natural sciences which have developed so far that in many respects they are almost self-planning and self-appraising step by step.

How our activities may develop over the next decade one can not at present say in any detail. For those who to be happy must have constant change it doubtless appears that the council has always been changing and always will; to those who find their greatest interest in the uniformities or quasi-uniformities of nature, it will doubtless appear that the council has held and will hold a single course directed toward improving the quality rather than increasing the quantity of work and of personnel in the social sciences; this was its aim when it started and this has been its direction ever since. Nobody need worry that the quantity of writing in the social sciences will ever fail, the emotional drive to write one's opinions and to proselytize others and the emotional drive to do something to the world about us (however so little we practice the Confucian principle of doing something to ourselves) are strong enough to maintain a high degree of activity in social science. Indeed, these drives are so persistent that they must be counterbalanced by conscious and conscientious effort to improve the scientific quality of work in this field if improvement is to be assured. Herein has lain and still lies the council's unique opportunity.

I should perhaps state explicitly, what may be apparent, that the word science will cover almost anything and on different occasions does, from the art of the billiard player or ball pitcher to the technique of the mathematician or chemist. As we use it here in the council, the meaning is more akin to the latter than to the former. It is, I presume, in this meaning that John Dewey used the word in his statement.[2]

(1) One of the only two articles that remain in my creed of life is that the future of our civilization depends upon the widening spread and deepening hold of the scientific habit of mind; and that the problem of problems in our education is therefore to discover how to mature and make effective this scientific habit. Mankind so far has been ruled by things and by words, not by thought, for till the last few moments of history, humanity has not been in possession of the conditions of secure and effective thinking. Without ignoring in the least the consolation that has come to men from their literary education, I would even go so far as to say that only the gradual replacing of a literary by a scientific education can assure to man the progressive amelioration of his lot.

Scientific method is not just a method which it has

[2] Taken from a "box" on p. 57 of Bull. No. 1143 of the University of the State of New York, July 1, 1938, giving the proceedings of the 73rd convocation held in celebration of the one hundredth anniversary of the Division of Science and State Museum on October 15, 1939. Much of this statement was included toward the end of Dewey's address "Science as subject matter and as method" at the Boston meeting of the A.A.A.S. in 1909. See SCIENCE, vol. 31, p. 127, 1910.

been found profitable to pursue in this or that abstruse subject for purely technical reasons. It represents the only method of thinking that has proved fruitful in any subject—that is what we mean when we call it scientific. It is not a peculiar development of thinking for highly specialized ends; it is thinking so far as thought has become conscious of its proper ends and of the equipment indispensable for success in their pursuit.

If ever we are to be governed by intelligence, not by things and by words, science must have something to say about what we do, and not merely about how we may do it most easily and economically. And if this consummation is achieved, the transformation must occur through education, by bringing home to men's habitual inclination and attitude the significance of genuine knowledge and the full import of the conditions requisite for its attainment.

(2) The other "article" is faith in democracy as a social mode of life.

It is in a similarly restricted sense that J. B. Conant used the word science in his round-table discussion at our annual meeting two years ago. As John Dewey emphasized that if we are ever to be governed by intelligence, not by things and by words, science must have something to say about what we do, so J. B. Conant emphasized that science was that which persisted and accumulated. Science has to persist and to accumulate if we are to have the assured information to say how we may most easily and economically accomplish something and still more must science have those characteristics of persistence and accumulation if we are, with any assurance other than that of the gambler, to say what shall be done.

It is no use to minimize the difficulty of realizing the aim which the council has set for itself and no use to expect large or immediate results. We have gradually to replace a literary by a scientific education, as Dewey says, and that takes generations, not collegiate generations, but human generations; we have to train the teachers of the future. It is so easy to be tempted to accept a high-sounding generalization. Peace without victory—does history show that one attains peace that way? Then there is Dewey's second article of faith—in democracy as a social mode of life. An excellent article of faith for our mores, but if we are to get away from governance by words and if science is to tell us what to do, science must give us foundations for our faiths; because actually it is our faiths and our emotions which really control us in our doings. What would a scientific approach tell us about the advantages or disadvantages of the adoption of a faith in democracy as a way of life? Additional evidence may be available during this century.

In this summer's reading I came across something quoted with approbation from Aristotle by one of the great humanists of his generation, C. C. Felton, whilom president of Harvard College, in "Ancient and Modern Greece," Volume I, page 482:

> The insolence of demagogues is generally the cause of ruin in democracies. First, they calumniate the wealthy, and rouse them against the government, thus causing opposite parties to unite against a common danger. Next, they produce the same result by stirring up the populace and creating a sense of insecurity. Nearly all the tyrants of old began with being demagogues. . . . In well-balanced commonwealths, besides strict observance of established laws, it is especially necessary to keep close watch upon little matters. For a great change in the laws may creep on gradually, just as a small expense often incurred ruins a large fortune. . . . Next, let men be on their guard against those who flatter and mislead the multitude; their actions prove what sort of men they are. . . . Of the tyrant, spies and informers are the principal instruments. . . . War is his favorite occupation, for the sake of engrossing the attention of the people, and making himself necessary to them as their leader. An unbridled democracy is exactly similar to a tyranny. Its objects and instruments are the worst, and both are equally served by the tamest of mankind. It is always anxious to lord it as a sovereign; it therefore has its flatterers in the shape of demagogues. Ancient customs must be done away with; ancient ties, civil and sacred, must be broken; everything must be changed according to new and false theories; and the result is an assimilation of democratic to tyrannical government, in its habits and modes of action.

This passage is not only an indication of the sources from which danger may come to democracy; it is a series of theorems on popular government. Were they true as of Aristotle's time? Do they remain true to-day? The function of science is to bulwark opinions of the wise with proofs by the patient after modifying those opinions in the light of the evidence available. For some of the social sciences, this function may perhaps be exercised adequately by comparative contemporary studies on a wide geographical base; but for some of them only the studies of comparative history will serve, for the reason that the development of societies is a slow process. "The absence of romance in my history," wrote Thucydides, possibly in reference to Herodotus, "will, I fear, detract somewhat from its interest; but if it be judged useful by those inquirers who desire exact knowledge of the past as an aid to the interpretation of the future, which in the course of human affairs must resemble if it does not reflect it, I shall be content."

The council has lived through two decades of hectic times and the end is not yet, nor will be for two decades more. In our early days we had what our director has called the magnilucrous twenties—the New Era written with capitals and supported by some able economists as permanent—and there was to be no top. Then we had the great depression from which

some economists drew the inference that depressions were self-accelerating with no bottom. These are the ways the crests and troughs of the waves appear to the seasick. Yet with the present state of social science as a science who could say with assurance, at the time, that the New Era economists were wrong and the doubters were right? Until there is a sounder scientific basis than appears to me yet available one can not be certain beyond reasonable doubt that those who turned out to be right or wrong were not so by chance. And how many of our historians have taught twenty college classes that an armistice was an armistice and that war was inevitable and that all of us should be steeling ourselves for it? What type of analysis would prove in 1935 that war was inevitable? The talk we had by a member of the State Department, I believe at Lake George, was sufficiently realistic so that none of us who heard it need have been heedless. We must have better teaching of history, of cultural history, of history serviceable in the Thucydidean sense to our State Department or the State Department will have to take a hand in the teaching. I hope Mr. Nichols may have something to say to this point.

Appraisal, planning, economic history and cultural history are enough and more to furnish the council with opportunities for exercising what our reviewing committee termed the primacy of its intellectual leadership; but there are of course other topics, some of them close to the heart of the chairman of our Committee on Problems and Policy.

People have talked about social science problems for all of recorded history; they probably have talked about the weather for quite as long. It would be of great benefit to all of us if we could know what the weather would be in the next crop season, but meteorological science has not advanced to where it can tell us. We must not expect too much of social science. We could not regulate the weather even if we could forecast it a season ahead; all we could do would be to adjust our actions to it. There is always hope that if we knew the economic and social future we could do something and would do something about it, other than adjust ourselves to it; but be that as it may, we can at least so educate ourselves as to adjust better to whatever may develop and that is in itself worth while, it is in line with being governed by intelligence.

We meet for the first time with our country at war. This ancient building and the American Philosophical Society have seen meetings during our every war from that of the Revolution to the present. If we disregard Indian wars, the periods of peace have averaged about twenty-five years; none has exceeded thirty-five years. As scientists we have to take the evidence of history that war is a recurrent phenomenon of society. Whether it can be prevented or not is very difficult to say. My old friend, F. A. Woods, biologist and historimetrician, came to the conclusion thirty years ago that war had not been less under the reign of the Prince of Peace than previously. My colleague Sorokin finds little evidence that war is decreasing. Against the background we have, we may infer that it will require extraordinary efforts to prevent future recurrences, and we must in nowise console ourselves that even with extraordinary efforts we shall be successful. If we were to approach scientifically the study of those efforts which might be most likely to succeed we should have intensively to study the conditions which had led in the past to the most enduring peaces and the conditions which had led to their rupture. We probably shall not approach the matter that way, but permit ourselves to be governed by words and things. Already all sorts of persons are coming forward with plans which are little more than emotional slogans, and this will continue, probably with acceleration. I will not advocate preparation for a peace conference; all I would suggest is a better knowledge of the conditions under which peoples live together in peace; I would seek exact knowledge of the past as an aid to the interpretation of the future which in the course of human affairs must resemble if it does not reflect it. The future of this country deserves the effort of the search even though the conclusion be that we must forever "speak softly and carry a big stick," neither of which suits some of our emotionalists.

THE AMERICAN INSTITUTE OF PHYSICS

A REPORT TO PHYSICISTS

By HENRY A. BARTON and GEORGE H. BURNHAM

THE American Institute of Physics has completed more than ten years of ever-increasing activity in behalf of its members, the five founder societies and, in turn, all physicists and the science of physics itself. Because of the increasing scope and importance of its activities, it is desirable that not only the physicists of the nation but all those interested in the advancement of science become better acquainted with the background, organization, and activities of the institute.

Briefly, the institute is a union of independent societies—the American Physical Society, the Optical

Society of America, the Acoustical Society of America, the Society of Rheology and the American Association of Physics Teachers—operated by them, through a governing board, to carry out certain functions better performed with the combined strength of such a joint organization than by the individual societies acting separately. It represents all of physics and all physicists in many matters of greatest importance to the progress and advancement of science. The majority of physicists, as members of one of the founder societies, "own shares" in the institute.

The detailed legal structure of the institute may be ascertained by any one who wants to look it up in the "By-laws of the American Institute of Physics Incorporated." It is a non-profit, educational corporation whose only members are the five founder societies, each as an entity. It has no individual members and collects no dues in the usual sense. It is controlled by a governing board of fifteen men—three named by each society.

Its Background

The institute had its origin in the pressing need for cooperation between the several American societies of physics, which need became apparent in 1930 and 1931 and was increasingly realized in the course of discussions held at that time between officers and committees of these societies. There were then operating these trends:

1. A notable and gratifying increase in American research activity calling for an increased number of pages in research journals without adequately increased income becoming available to pay the increased costs entailed. The publishing machinery of physics was no longer adequate for its task.

2. A growing tendency for physics to "split up." The Optical Society had been founded in 1916, the Acoustical Society in 1929. The Society of Rheology, partly concerned with physics, was founded in 1929. The American Association of Physics Teachers was in process of formation. Groups interested in other special fields of physics were seriously considering the establishment of still more societies.

No responsible person could contemplate these trends without grave concern. Must the results of research be inadequately reported or be suppressed through lack of funds? Must there be an increasing number of overlapping but unconnected societies for physicists to pay dues to? Would all the profitable applications of physics appear under some other name, rendering no recognition and no financial support back to the parent science? Did these many groups have no common interests and objectives which they could attain better together than separately?

Its Founding

A joint committee of four of the societies was finally formed to consider these challenging questions. The thought of a community or association of cooperating societies emerged from their discussions. With the financial support of the Chemical Foundation, and under the leadership of Dr. Karl T. Compton, Dr. George B. Pegram, Dr. John T. Tate, Dr. Paul D. Foote, Dr. Loyd A. Jones, Mr. William W. Buffum and a number of other well-known physicists, the first meeting of the joint committee laid the foundation for constructive action. The societies adopted the committee's recommendation that an "American Institute of Physics" be founded by them to provide a mechanism to combine their strength for common objectives, to study the publication problem, to obtain financial support, and to halt the dispersive trend of physics.

By formal action of the four societies represented on the joint committee, namely, American Physical Society, Optical Society of America; Acoustical Society of America, and Society of Rheology, the institute was founded in 1931. The newly organized American Association of Physics Teachers joined this group soon thereafter, and these five societies constitute the founder or member societies of the institute. With the help of Dr. John T. Tate, editor of *The Physical Review,* an immediate study of a joint publication program was begun.

Among the changes introduced in the journals as a result of Dr. Tate's study were (1) the adoption of a more economical, more easily read and generally more effective page size and layout for all the journals; (2) the unification and standardization of much of the work of handling manuscripts, proofs, non-member subscriptions, etc.; (3) the handling of all the journals by one printer and (4) the establishment, with the support of the Rockefeller Foundation, of the American Physical Society's plan of publication charges for all the journals.

These changes have resulted in very appreciable savings in publication costs because of the advantageous printing rates obtainable as a result of the combined publication program, and because of the elimination of duplicated effort through the unified publications procedures. Of even greater importance is the fact that through combination the journals strengthen each other both in quality and in circulation, and that their reputation as a coordinated research-publishing program reflects credit on all of physics.

Its Publication Program

The Publications Department issues eight periodicals, of which five are owned by and are published for several of the founder societies. These eight journals,

undoubtedly familiar to all physicists, are: *The Physical Review* and *Reviews of Modern Physics* (both published for the American Physical Society); *Journal of the Optical Society of America; The Journal of the Acoustical Society of America; American Journal of Physics* (formerly *The American Physics Teacher,* published for the American Association of Physics Teachers); *The Review of Scientific Instruments* (at one time published by the Optical Society of America); *Journal of Applied Physics* (formerly published by the American Physical Society as *Physics*); *The Journal of Chemical Physics* (founded by the institute).

The last three journals are now owned and published by the American Institute of Physics. Two of them, *The Review of Scientific Instruments* and the *Journal of Applied Physics,* carry a limited amount of advertising material of interest to physicists. This advertising, in addition to providing an opportunity for manufacturers and vendors to introduce their products and services to physicists, also provides a certain amount of financial support to the institute and hence to physics as a whole.

For the publication of its journal a society reimburses its agent, the institute, for only the actual net cost of supplying the journal to its members (the latter of course receiving it in partial return for their payment of dues to the society). This net cost means the residual item left after all income received by the institute in connection with the journal has been subtracted from its total publication cost. Such income includes that from non-member subscriptions, publication charges, reprint sales, back-number sales, contributions, etc. Thus the amount paid to the institute for publication purposes varies from year to year as publication costs and outside income vary. It is noteworthy that the societies during the period 1933–1941 paid, out of dues, only 10.8 per cent. of the total publishing cost of their journals, the rest being covered by the items of income mentioned above. This is an unusually favorable, if not unprecedented, instance of the financing of technical journals by scientific societies.

Among the general functions assigned to the American Institute of Physics has been the obtaining of much-needed new funds for publishing and other services important to physicists. That it has succeeded in performing this function is indicated by the fact that items of "new" income made available to physics through the institute, have totaled in the ten-year period 1932 through 1941 approximately $350,000. The significance of this figure may be appraised by comparing it with the total amount collected by the societies from their members in dues during the same period, namely, about $450,000.

It is appropriate at this point to mention the associates of the institute. These are a group of companies and institutions whose interest in physics is demonstrated by their contributions to the institute. Their dues ($175 per year) provide valuable support for the institute's maintenance and general work. The roster of associates in 1942 follows:

Allegheny Steel Company
Aluminum Company of America
American Telephone and Telegraph Company
Bausch and Lomb Optical Company
Bell Telephone Laboratories
Crane Company
Dow Chemical Company
E. I. du Pont de Nemours and Company
Eastman Kodak Company
General Aniline and Film Corporation, Agfa Ansco Division
General Electric Company
General Motors Corporation
Gulf Research and Development Company
Libbey-Owens-Ford Glass Company
Lockheed Aircraft Corporation
Loomis Laboratory
Massachusetts Institute of Technology, Department of Physics
Massachusetts Institute of Technology, Division of Industrial Cooperation
Radio Corporation of America
Research Corporation
Shell Development Company
Sperry Gyroscope Company, Inc.
The Texas Company
Universal Oil Products Company
Waugh Laboratories
Westinghouse Electric and Manufacturing Company

Non-Publishing Activities

The most important duty of the institute, aside from managing the journals, is the "promotion of the common objectives of the Founder Societies." Just as it is difficult to determine and describe briefly practical steps toward gaining these objectives, it is almost impossible to measure in any tangible terms the results of this phase of the institute's work. It may be stated in emphatic though general terms that physics has in the last decade enjoyed considerably increased prestige and support. Funds have been made available by universities and foundations for many large research projects in physics. The applications of physics are becoming increasingly recognized as such and their value is being more and more definitely appreciated in industry, in medicine and in other technical fields. This recognition of physics was no doubt long overdue, but many who are in influential positions credit the American Institute of Physics with an im-

portant share in bringing about, or at least hastening, its achievement.

To meet the cost of the varied non-publishing activities of the institute, the founder societies jointly provide an operating and maintenance fund. As a basis for calculating each society's annual contribution to this fund, the amount expended for the publication of each society's journal is taken as a measure of that society's activity in physics; a sum equal to 15 per cent. of this amount is contributed by each society to the fund. This basis and this percentage were agreed upon by the societies in 1932.

In 1941 some $10,500 was expended by the institute for all its general (non-publishing) activities. It has been estimated that the total annual income received by members of the founder societies is approximately $10,000,000. In other words, about one tenth of one per cent. of the total income of the physicists of America was used to coordinate their work and to serve themselves and society in general by directing attention to the capacities of their services. It should be apparent that this restriction of the outlay for such purposes to so small a fraction of their income severely limits the extent of cooperation which physicists can render to one another, to the press, to the government, and to national agencies in other scientific and technical fields.

Physics is a human activity and, like all others, depends upon the interest with which people in general regard it. In the long run, solid achievement is the best road to general recognition, but even achievement can be overlooked, taken for granted, forgotten through familiarity or credited to the wrong agent. Unless physicists and their friends occasionally take positive steps to demonstrate and call attention to the advances and services of physics, public attention will readily be diverted to fields which are better displayed and more repeatedly praised. Publicity is not 100 per cent. palatable to physicists, but there are forms which come a close second to pure education in acceptability. The institute has used and has encouraged physicists to use such forms.

Several excellent and readable books about physics and its applications have been written and published at the instigation of the institute as a part of its education-publicity program. Among these might be mentioned the highly successful "Atoms in Action," by G. R. Harrison.

A number of successful symposia have been arranged to present the capacities of physics to well-selected audiences. An example was a conference on biophysics held in Philadelphia in November, 1937, which was attended by some 800 biologists, medical men, chemists and physicists, and which stands as a kind of first milestone in this important borderline field. Another example was the Conference on Applied Nuclear Physics held in cooperation with the Massachusetts Institute of Technology in 1940. Here again the influence of physics—the fundamental science—in a number of fields was demonstrated.

The institute sponsored these symposia because the public and its industrial and educational leaders would observe in them typical instances of the advance of physics and its uses. The symposia were widely heralded and well reported. In both instances there have been repeated demands for repetitions. Other institute symposia have dealt with physics in the metal industries, in the automobile industry, and in the manufacture of textiles.

Several years ago the institute organized its Council on Applied Physics, a group of industrial research directors and others, which met several times and by its discussions clarified the relationship between education, fundamental research and industrial physics. These discussions brought about the decision to hold the series of symposia mentioned and also the decision to establish the *Journal of Applied Physics*. This journal has probably been more effective than any other single medium of effort in establishing physicists in industry. Members of the council, as friends of physics, have individually accomplished much in the same direction.

The Institute and the War

The war inevitably brought the institute numerous new and unforeseeable problems and duties. The prominent part taken by physicists in certain phases of the war effort and the demands made on physics and physicists by the war found the institute and its staff prepared to meet the emergency. In order to insure that decisions and recommendations relating to problems growing out of the war would be made wisely as well as speedily, a war policy committee of the institute was appointed with emergency powers of action. The personnel of the committee for which the director of the institute acts as secretary is as follows:

Dr. Oliver E. Buckley, president of Bell Telephone Laboratories.

Dr. Karl T. Compton, president of Massachusetts Institute of Technology.

Dr. Homer L. Dodge, dean of the Graduate College, University of Oklahoma.

Dr. R. C. Gibbs, chairman of the department of physics, Cornell University.

Dr. Paul E. Klopsteg, president of the Central Scientific Company, and chairman.

The committee has met on frequent occasions and has discussed and adopted recommendations touching not only on the immediate phases of the institute's

contribution to the war effort but also on more fundamental, long-range plans for the solution of the present and continuing problems of physics and the war. Its reports have been widely circulated and are worthy of the careful study of all concerned with these problems and the future of physics.

Aside from the larger scale activities of its war policy committee, the institute and its staff are engaged in a variety of projects and activities—each relatively small in itself but all together summing up to a very significant total. A series of bulletins has been issued supplying to heads of college physics departments and to others information which should be disseminated more quickly than is possible through the usual publication channels. These bulletins have reported Selective Service policies and procedures, War Policy Committee actions, educational policies of the Army and Navy Enlisted Reserve programs, War Production Board regulations and other topics of immediate concern to physicists. The institute has become an increasingly important center for information and advice regarding all phases of the interrelationship between physics and the official agencies guiding the war effort.

Much of the institute's effort has been concerned with the problem of obtaining suitable personnel for war-connected research and other work. Partly as a result of this experience, the director of the institute was asked to organize, in the spring of 1941, the Office of Scientific Personnel in the National Research Council at Washington. Dean Homer L. Dodge, of the University of Oklahoma, a former member of the institute's governing board, directs the activities of this office.

The plight of the nation, faced in its hour of greatest need by inadequate manpower trained in physics, demands that steps be taken to help provide against a future shortage of physicists. Some such steps have been taken by the institute, and it is gratifying to acknowledge that other steps—even more effective because of their source—have been taken by the Navy, the Army Air Force and the U. S. Office of Education, to emphasize physics and mathematics in high schools and to acquaint high-school graduates with the practical usefulness of the continued study of physics in college. The institute has been represented in Washington conferences at which the opportunity to encourage and expedite these actions of the government has been grasped. High-school programs can not yield physicists to meet the present shortage but they do more than lay the basis for the future physics strength of the country. They can provide the best pre-induction training for the large number of men the Army and the Navy will need to operate technical devices of warfare.

Physics as a Profession

The increased use of physicists in industry and the importance attached to physics in the present war program have placed new emphasis on physics as a professional field of work. The term "physicist" is becoming more widely known and recognized. This recognition of physics as a profession, and of "physicist" as a professional title, not only carries with it a considerable distinction but brings up numerous important problems concerned with the establishment and safeguarding of professional levels and standards. It is time to shape policies and plans for the protection of the title "physicist" and the maintenance of the high standards now associated with it, to determine methods of recruiting and selecting persons of high ability for the profession, to evaluate present educational standards with a view to insuring continued and improving training, to fight for appropriate rewards for the physicist, and to guide social forces such as labor unions and government regulations to a proper understanding of the profession's character, potentialities and needs.

In the American Institute of Physics physicists have a record of progress and achievement of which they may be proud. It is evident, however, that the problems of its future are fully as difficult and important as those of its past. The very success of the institute in thus far promoting the welfare and development of physics has placed in its hands added responsibilities and new tasks which must now be performed. Only a truly cooperative organization, fully supported by all American physicists, can adequately meet these responsibilities and successfully carry out these tasks.

OBITUARY

DR. HOWARD ATWOOD KELLY

DR. KELLY, the last of the "Big Four" of Sargent's well-known portrait of the early Johns Hopkins Hospital leaders (Osler, Welch, Halsted and Kelly) to survive, died in Baltimore on January 12, 1943. Had he lived five weeks longer he would have been 85 years of age.

Born in Camden, N. J., on February 20, 1858, he received his A.B. degree at the University of Pennsylvania in 1877 at the age of 19. He entered the medical department there as a student in the autumn of the same year, but at the end of the second year because of ill-health (insomnia) was compelled to interrupt his medical studies. He went to Colorado,

to live in the open air, earning his own living as a cowboy for a year. Returning to the University of Pennsylvania he received his M.D. degree there in 1882. After a year as resident physician in the Episcopal Hospital he established himself in Kensington, turned his attention especially to the practice of gynecology and established a small private hospital, which later developed into the well-known Kensington Hospital for Women.

During 1886 and 1888 Dr. Kelly traveled in Europe, visited the leading gynecological clinics in Great Britain and in Germany and observed the abdominal and pelvic operations of the best surgeons there. In 1888 he was made associate professor of obstetrics in the University of Pennsylvania. On his second visit to Germany he was married in Danzig to Laetitia Bredow, who became the mother of nine children and who died on the same day as did Dr. Kelly.

Early in 1889 he was called to Baltimore to be professor of obstetrics and gynecology in the Johns Hopkins University and gynecologist-in-chief to the Johns Hopkins Hospital. He organized and developed the department at the hospital and arranged for courses of instruction for graduates in medicine. On the opening of the medical school a few years later he organized the courses of lectures and the clinical work for the students of medicine. Owing to the rapid development of his private practice he opened in 1892 a private hospital in the city, which gradually grew to be a large institution. He early relinquished the work in obstetrics but continued as professor of gynecology until 1919, when he was succeeded by Dr. Thomas S. Cullen; he then became emeritus professor.

As an operator in his special domain, it is said that he has never been equalled in skill, in celerity or in judgment. Many distinguished surgeons have watched him operate and all marveled at his manual dexterity. As the originator of new operative procedures upon the female generative organs and upon the kidneys and ureters he rapidly became world-renowned and in the development of operative technique his contributions have been designated as epoch-making.

His assistants through the training they received at his hands found the opportunity to develop into expert gynecologists. Many of them came to occupy important positions, among them Hunter Robb, W. W. Russell, John G. Clark, B. R. Schenck, J. E. Stokes, G. R. Holden, John Sampson, A. L. Stavely, C. W. Vest, L. R. Wharton, Otto Ramsay, D. B. Casler, E. H. Richardson, G. L. Hunner, Thomas S. Cullen, who succeeded him in the chair at Johns Hopkins, and Curtis F. Burnam and William Neill, Jr., who continued his work at his private hospital and in his radium clinic. Dr. Kelly was a good executive, for he learned early to delegate important responsibilities to his associates, developing them and at the same time giving him greater freedom for the exploration of new fields.

During his lifetime he was the author of more than a dozen books and he contributed some 500 articles to scientific journals. Among his books, "Operative Gynecology," "The Vermiform Appendix and its Diseases" (with Dr. Hurdon), "Walter Reed and Yellow Fever," "Gynecology and Abdominal Surgery" (with Dr. Noble), "Medical Gynecology," "Myomata of the Uterus" (with Dr. Cullen), "Cyclopedia of American Medical Biography," "Some American Medical Botanists," and "Diseases of the Kidneys, Ureters and Bladder" (with Dr. Burnam) have been widely read. His "Stereo-Clinic" consisted of some 20 volumes describing the more important gynecological operations, accompanied by stereoscopic photographs of their different stages; this represented a new method of teaching surgery. For the illustrations of his other volumes he brought the medical artist, Max Broedel, from Germany, who later developed the department of "Art Applied to Medicine" at the Johns Hopkins Hospital.

Dr. Kelly was always a naturalist, his great love for natural science having been promoted by his friendship with the paleontologist, Professor E. D. Cope, during his early student days. Professor Cope had even offered to send him in charge of an exploring and collecting expedition to South America, but owing to his father's objection, he entered upon the study of medicine instead. He always maintained his interest in botany and zoology and was an ardent collector of plants and animal specimens. He developed an especial interest in mushrooms and in snakes, and was made an honorary member of several botanical and zoological societies in this country and in Europe.

Always athletic, Dr. Kelly was a champion swimmer at the University of Pennsylvania and he became an expert canoeist during his summer holidays, which he spent at a camp in northern Ontario. He was a devoutly religious man and in 1925 wrote a book entitled "A Scientific Man and the Bible." He took his duties as a citizen seriously and tried to improve political and moral conditions in Maryland. At one time he was a watcher at the polls in South Baltimore and he participated in anti-vice crusades and in the movement for pure food laws.

Many honorary degrees were conferred upon Dr. Kelly, among them the LL.D. degree from the University of Aberdeen (1906).

LEWELLYS F. BARKER

RECENT DEATHS

DR. FRANCIS HUNTINGTON SWETT, professor of anatomy in the Duke University Medical School since

1930, died on February 10 at the age of forty-nine years.

GEORGE HERBERT BROWN, director of the department of ceramics at Rutgers University, died on February 8 at the age of fifty-eight years.

A CORRESPONDENT writes: Richard C. Cady died on January 15, at the age of 35 years, as the result of accidental injuries received while on duty overseas. For the past year he has served as a geologist in locating well sites to develop water supplies for military establishments of the United States Army in Africa and Asia. He was a member of the Geological Survey, U. S. Department of the Interior, for twelve years. His most important research was on the Pleistocene and Tertiary geology and ground-water hydrology of the Great Plains.

DR. C. TATE REGAN, keeper of zoology in the British Museum and an authority on systematic ichthyology and on the phylogeny of the lower vertebrates, died on January 13 at the age of sixty-five years.

SCIENTIFIC EVENTS

PURE MATHEMATICS IN RUSSIA

ONLY a few scholars in this country may have easy access to Russian publications since the war. It might, therefore, be of interest to give a short list of titles of papers in mathematics published from January to July, 1942, in the "Comptes Rendus (Doklady) de l'Academie des Sciences de l'URSS."

Pontrjagin: Mappings of the three-dimensional sphere into an n-dimensional complex.

Tschebotarëw: On a particular type of transcendent equations.

Khintchine: Lois de distribution des fonctions sommatoires dans la mécanique statistique.

Vinogradow: On the estimation of trigonometrical sums.

Linnik: On Weyl's sums.

Raikov: A new proof of the uniqueness of Haar's measure.

Raikov: On absolutely continuous set functions.

Šmulian: Approximation in the space of bounded functions.

Šilov: On the Fourier coefficient of a class of continuous functions.

Pontrjagin: Characteristic cycles on manifolds.

Tschebotarëw: On R-integrable polynomials.

Alexandroff, A.: Existence and uniqueness of a convex surface with a given integral curvature.

Wassilkoff: Partially ordered linear systems, Banach spaces and systems of functions.

Linnik: On the representation of large numbers as sums of seven cubes.

Tschebotarëw: On entire functions with real interlacing roots.

Tschebotarëw: On some modification of Hurwitz's problem.

Gnedenko: On locally stable probability distributions.

Gontcharoff: Sur la distribution des cycles dans les permutations.

Gnedenko: Investigation of the growth of homogeneous random processes with independent increments.

Malcev: Subgroups of Lie groups in the large.

Gontcharoff: Sur une extension du théorème de Gauss-Lucas.

Malcev: On the representation of an algebra as a direct sum of the radical and a semi-simple subalgebra.

This impressive list of research work in abstract "pure" mathematics, published during the most gigantic struggle which human history has seen, could easily be multiplied by papers from this and other journals concerning all parts of theoretical physics, astrophysics, celestial dynamics, etc. It is really significant that the first Stalin Prize (1940) has been awarded to I. M. Vinogradoff for his paper, "A New Method in the Analytical Theory of Numbers."

O. NEUGEBAUER

BROWN UNIVERSITY

NEW AND RARE INSTRUMENTS

THE Committee on Location of New and Rare Instruments has the following requests and offers:

INSTRUMENTS REQUESTED

Cathetometer (32″ ± 0.003″).
Two-circle reflecting Goniometer.
Loewe Zeiss Liquid Interferometer.
Quartz Microscope.
Zeiss Optimeter.
Hypervac Vacuum Pump (Cenco No. 93,000).
Refractometers: Bausch & Lomb and Zeiss-Pulfrich.
Quartz Spectrograph.

INSTRUMENTS OFFERED

Leeds and Northrup Thermionic Amplifier No. 7673.
Alb. Rueprecht & Sohn Analytical Balances.
Roller-Smith Co. Surface Tension Balances.
Bausch & Lomb Centrifuge.
Gaertner Chronograph.
Fisher Electropode.
Leeds and Northrup Microammeter Type R.
Weston Microammeter for D.C.
Microscopes: Bausch & Lomb, Poller, Winkel-Zeiss, Zeiss.
Sartorius-Werke Brain Microtome.
Hartnack Polariscope 400 mm tube.
Cenco Hyvac Pumps.
pH meter model Chemie (Bergmann & Altmann).
Radio Test Instruments and Equipment.
Zeiss Refractometer, dipping type.
Bragg X-Ray Spectrometer.
Keuffel & Esser Spectrophotometers.
Franz Schmidt & Haensch—Spectroscope (student

model); Spectrometer; Grating Spectrograph; Universal Spectrograph; Precision Micro-Colorimeter; Immersion Colorimeter.
Chemical Model of the German Typewriter "Adler."
G.E. Wattmeter Type P3.

Information concerning these offers and requests for rare instruments that can be sold, loaned or leased for essential war or other research can be obtained from D. H. Killeffer, chairman of the committee, 60 East 42nd Street, New York, N. Y.

METEOROLOGICAL TRAINING FOR THE ARMY AIR FORCES

AN opportunity for high-school graduates with two and a half years of mathematics to receive training in basic pre-meteorology, leading to commissions, has been announced by the Army Air Forces. The new course will begin on May 17. At the same time applications for courses, beginning on March 1, will continue to be accepted.

Civilians, enlisted men and members of the Enlisted Reserve Corps, including students who have recently graduated or are about to do so, are eligible for the courses. Pay while in training, and free uniforms, board, room and tuition are provided. Applications should be addressed to "Weather," care of the University of Chicago.

The basic premeteorology course for high-school graduates requires twelve months, and is followed by advanced training in meteorology for eight months and commissions as meteorological officers in the Army Air Forces. Requirements are: age, 18 to 21 years, inclusive; two and a half years of high-school mathematics, including algebra and plane geometry, as well as one year of high-school science.

Applicants for the premeteorology course opening on March 1 must be between the ages of 18 to 30, inclusive, and must have completed college algebra, trigonometry and analytic geometry. Previous requirements of one year of residence in college will be waived for outstanding students. This course requires six months, and is followed by the advanced training in meteorology.

The curriculum in the basic course is equivalent to two years of college study in mathematics and science. The premeteorology course is the equivalent of one year of college in these fields. It is expected that both courses of study will be credited by colleges toward post-war degrees.

The basic course in premeteorology and the course in meteorology will be offered at twenty-nine selected colleges and universities throughout the country.

PHILADELPHIA MEETING OF THE INDUSTRIAL RESEARCH INSTITUTE

THE importance of research, both to the present war effort and to our economic development after the war, was given special emphasis at the recent winter meeting of the Industrial Research Institute in Philadelphia on January 22 and 23. It was attended by over seventy-five industrial executives and research directors, representing member companies and their guests. The sessions were all informal round-table conferences, as is the custom in institute meetings.

At the opening session on Friday morning, W. C. Stevenson, chief of the Laboratories and Technical Equipment Section, Safety and Technical Equipment Division of the War Production Board, described the present regulations of the board that affect the supply of materials and equipment for research laboratories. He stated that the War Production Board feels that research is one of the most important phases of the war effort. The Laboratories and Technical Equipment Section has been charged with the duty of working out ways in which laboratories doing essential research can obtain materials and equipment with the least possible delay and burdensome paper work. Mr. Stevenson explained how to take advantage of the special concessions that have already been secured for research laboratories under the Production Requirements Plan and the Controlled Materials Plan that is gradually supplanting it.

R. C. Newton, vice-president of Swift and Company, Chicago, led a discussion on post-war planning and the research laboratory. It was brought out that, without slackening their all-out war effort, many industrial concerns are giving some organized study to post-war problems and how to meet them. The important part that industrial research directors must play in the post-war planning activities of their companies was emphasized.

There was a symposium on new research tools and their applications in place of the usual visit to a local plant or laboratory. This comprised talks, illustrated by movies and slides, on high-speed photography by Professor Harold E. Edgerton, of the Massachusetts Institute of Technology, and F. Nickel, Jr., of the Western Electric Company, and on the electron microscope by M. C. Banca, Radio Corporation of America, Camden, N. J.

The possibilities and limitations of job evaluation procedures, as applied to research organizations, were discussed at simultaneous group conferences under the leadership of F. W. Blair, chemical director, the Procter and Gamble Company, Ivorydale, Ohio; J. N. Dow, technical director, Bigelow Sanford Carpet Company, Thompsonville, Conn.; J. M. McIlvain, administrative supervisor, Research and Development Department, the Atlantic Refining Company, Philadelphia, Pa.; and R. S. Taylor, chief engineer, Servel, Inc., Evansville, Ind. Following this, A. G. Ashcroft, product engineer, Alexander Smith and Sons Carpet Company, Yonkers, N. Y., chairman of a special

committee on the education, selection and training of research personnel, presented the results of an inter-laboratory study of scientific aptitude and vocabulary tests for research personnel. A business meeting of the institute concluded the formal program.

NOMINATIONS OF OFFICERS OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

THE National Nominating Committee of the American Institute of Electrical Engineers, consisting of members from various parts of the country, has nominated the following official ticket of candidates for the offices becoming vacant on August 1:

For President: Nevin E. Funk, vice-president in charge of engineering, Philadelphia Electric Co.

For Vice-presidents:

Middle Eastern District, W. E. Wickenden, president, Case School of Applied Science, Cleveland, Ohio.

Southern District, C. W. Ricker, professor and head of the School of Electrical Engineering, Tulane University, New Orleans, La.

North Central District, L. A. Bingham, assistant professor of electrical engineering, University of Nebraska.

Pacific District, J. M. Gaylord, chief electrical engineer, Metropolitan Water District of Southern California, Los Angeles.

Canada District, W. J. Gilson, general manager, Eastern Power Devices, Ltd., Toronto.

For Directors: C. M. Laffoon, engineering manager, A. C. Generator Eng. Dept., Westinghouse Electric and Mfg. Co., East Pittsburgh.

C. W. Mier, engineer, Southwestern Bell Telephone Co., Dallas, Texas.

S. H. Mortensen, chief electrical engineer, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

For National Treasurer: W. I. Slichter, professor emeritus of electrical engineering, Columbia University.

These official candidates, together with any independent nominees that may be proposed later in the manner specified by the constitution and by-laws, will be voted upon by the membership at the coming election this spring.

H. H. HENLINE,
National Secretary

AWARD OF THE WILLARD GIBBS MEDAL

To Dr. Conrad Arnold Elvehjem, professor of biochemistry, University of Wisconsin, the Chicago section of the American Chemical Society has awarded the thirty-second Willard Gibbs Medal, founded by William A. Converse. This is the highest award that the section can bestow. It is given each year in special recognition of "eminent work in and original contributions to pure or applied chemistry." The medal is awarded to Dr. Elvehjem,

For his studies involving trace elements in nutrition, begun in 1928, in collaboration with Hart, Steenbock and Waddell, with the discovery that copper is essential to the formation of hemoglobin and for subsequent extensive studies of the metabolism of iron, copper, manganese, zinc, cobalt, selenium, boron and aluminum and their function in nutrition.

For studies in tissue respiration, begun at Cambridge and since 1929 applied to the study of vitamin function, which have shown the relation of thiamine to cocarboxylase, riboflavin, *d*-amino acid oxidase and xanthine oxidase, and of nicotinic acid to coxymase.

For studies involving the B vitamins, begun with the use of the chick as test animal and the use of liver extract as vitamin source, which resulted in his greatest achievement—the discovery of nicotinic acid as a cure for black tongue in dogs.

For continuing pioneer work; in discovering the place of nicotinic acid in the fight to combat black tongue, pellagra and other deficiency diseases occurring particularly in the southern part of the United States; in demonstrating that chick dermatitis is due to pantothenic acid deficiency; in the discovery of a very labile factor in green, succulent material through studies with mineralized milk diets, which lead to further studies on synthetic diets for test animals; and for studies on the newer members of the vitamin B complex, now in progress.

Dr. Elvehjem was born in McFarland, Wis., on May 27, 1901. He was graduated from the University of Wisconsin in 1923 and received his Ph.D. degree from the same institution in 1927.

He has been associated with his Alma Mater, without interruption, since 1925, when he became an instructor in biochemistry. He became assistant professor in 1930, after having spent a year abroad studying at the University of Cambridge, England. He was appointed associate professor in 1932 and professor in 1936.

The formal presentation of the medal will be made at the meeting of the Chicago section on May 20.

SCIENTIFIC NOTES AND NEWS

DR. DONALD D. VAN SLYKE, a member of the Rockefeller Institute for Medical Research, Department of the Hospital, New York City, has been elected an honorary member of the Kungl. Vetenskaps-Societeten (Royal Society of Sciences) of Upsala, Sweden.

AT the commencement exercises of the Marquette University School of Medicine on February 13, the degree of doctor of science was conferred on Rear Admiral Ross T. McIntire, Surgeon General of the United States Navy.

DR. LESLIE T. WEBSTER, a member of the Rocke-

feller Institute for Medical Research, received the Dog Writers Association fifth annual award for meritorious work on the diseases of dogs over a long period of time. The plaque was presented to Dr. Webster at a meeting of the association on February 10.

THE Pittsburgh Award, given annually for "outstanding work in chemistry" by the Pittsburgh Section of the American Chemical Society, will be presented on February 18 to Dr. Charles Glen King, scientific director of the Nutrition Foundation, on leave of absence from the University of Pittsburgh, at a dinner at the University Club given in his honor. Dr. King made an address on recent developments in nutrition. Dr. George D. Beal, assistant director of the Mellon Institute, presided. The speakers were Rufus H. Fitzgerald, vice-chancellor of the University of Pittsburgh; Dr. Alexander Silverman, head of the department of chemistry; Charles F. Lewis, director of the Buhl Foundation, and H. J. Heinz, II. Former recipients of the medal are E. Hall, Charles E. Nesbit, Andrew W. and Richard B. Mellon, Francis C. Frary, George H. Clapp, Edward R. Weidlein, Alexander Silverman and Webster N. Jones.

AT the one hundred and fifty-eighth meeting of the American Institute of Mining and Metallurgical Engineers, John Robert Suman, in charge of production for the Humble Oil and Refining Company, Houston, Texas, a past president of the institute, was presented with the Anthony F. Lucas Gold Medal "for distinguished achievement in improving the technique and practice of producing petroleum." Paul D. Merica, vice-president of the International Nickel Company, and Essington Lewis, of Melbourne, director general of Munitions and Aircraft Production for the Commonwealth of Australia, were presented with certificates of honorary membership. Dr. Vladimir K. Zworykin, associate director of the Laboratories of the Radio Corporation of America, delivered the annual Institute of Metals lecture. He spoke on "Applications of the Electron Microscope in Metallurgy." At the annual banquet William Jeffers, rubber director, made an address on "Transportation."

WALLACE P. COHOE, consulting chemist, New York, N. Y., has been nominated for the presidency of the Society of Chemical Industry.

DR. J. BURNS AMBERSON, JR., of the New York University College of Medicine, was reelected president of the New York Tuberculosis and Health Association at the annual meeting held in New York on February 9. He was also appointed representative director of the National Tuberculosis Association.

DR. FREDERICK B. NOYES has been elected president of the Institute of Medicine of Chicago. He is one of the few dentists who are members of the institute and the first of his profession to become its presiding officer.

DR. IVOR GRIFFITH, president of the Philadelphia College of Pharmacy and Science, has been elected president of the American Pharmaceutical Association.

DR. HOWARD H. CUMMINGS, of Ann Arbor, has been appointed chairman of the department of postgraduate medicine and professor of postgraduate medical education at the University of Michigan. Dr. Cummings is president of the Michigan State Medical Society.

DR. RAYMOND L. GREGORY, professor of pharmacology at the medical branch at Galveston of the University of Texas, has been appointed professor of medicine and director of the outpatient clinic and continuation courses.

DR. WILLIS A. GORTNER, formerly of General Mills, Inc., has been appointed assistant professor of biochemistry in the School of Nutrition of Cornell University. He will be engaged in teaching and research in the field of food processing.

DR. GEORGE E. HOLM, biochemist in the U. S. Bureau of Dairy Industry since 1920, has been appointed chief of the Division of Dairy Research Laboratories to succeed Dr. Lore A. Rogers, who retired in August, having completed more than forty years in dairy research work in the U. S. Department of Agriculture.

DR. RAYMOND HUSSEY, associate professor of medicine in the Johns Hopkins University School of Medicine, a member of the Council on Industrial Health of the American Medical Association, has been appointed scientific director of the new Army Industrial Hygiene Laboratory at the School of Hygiene and Public Health of the Johns Hopkins University. The laboratory will be conducted under the direction of the occupational hygiene branch of the Division of Preventive Medicine of the Office of the Surgeon General of the Army. It will maintain safe standards of occupational hygiene in Army-owned arsenals, industrial plants and depots. It will also train men to inspect these places for poor lighting, toxics in the air, etc.

SIR JOHN LEDINGHAM, F.R.S., will retire on March 31 from the post of director of the Lister Institute of Preventive Medicine, which he has held since 1930. His successor will be Dr. A. N. Drury, F.R.S., Huddersfield lecturer in special pathology of the University of Cambridge, a member of the scientific staff of the Medical Research Council.

ROBERT L. TAYLOR, since 1938 divisional advertising

manager of the Organic Chemicals and Merrimac Divisions of the Monsanto Chemical Co., St. Louis, Mo., has been appointed editor of *Chemical Industries,* to succeed Walter J. Murphy, who recently became editor of *Industrial and Engineering Chemistry.*

JOHN M. DAVIES has been made director of physical research of the B. F. Goodrich Company. He will supervise the study of rubbers, elastics, plastics and other materials.

RICHARD P. BROWN, chairman of the board of the Brown Instrument Company of Philadelphia and vice-president of the Minneapolis-Honeywell Regulator Company, has been elected a member of the board of trustees of the Drexel Institute of Technology, Philadelphia, of which he is an alumnus. Mr. Brown is a member of the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, and for the past year has been regional consultant for the Defense Plant Corporation in the region surrounding Philadelphia.

DR. JOHN T. CURTIS, assistant professor of botany at the University of Wisconsin, has leave of absence for the duration of the war. He is studying and carrying on research work for the Government on latex-producing plants and their use in producing synthetic rubber. Dr. Hugh E. McKinstry, professor of geology, now with the War Production Board, has been given a furlough and leave of absence for the second semester.

PHILIP D. REED, chairman of the board of the General Electric Company, has resigned and will return to London to continue his work as deputy chief of the Harriman Mission.

PROFESSOR CAREY CRONEIS, of the department of geology of the University of Chicago, gave on February 6 an address entitled "The Ancient Background for Modern Warfare" before the Purdue University chapter of Sigma Xi.

DR. HARVEY L. CURTIS, chief of the Inductance and Capacitance Section of the Electrical Division, National Bureau of Standards, delivered on February 18 the address of the retiring president of the Washington Academy of Sciences. It was entitled "A Scientific Recreation—the Accuracy and Extent of Measurement."

DR. ALBERT F. BLAKESLEE, Neilson research professor at Smith College and director of the Smith College Genetics Experiment Station, spoke before the Sphinx Club of Brown University on January 14 on "Science in Every-day Life," and on January 18 he gave a lecture on "Polyploidy and Evolution" before the colloquium on speciation of the department of botany of the University of Pennsylvania.

The Lancet announces that this year's lectures of the Royal College of Physicians of London include: February 9 and 11, Professor M. Greenwood, F.R.S., "Medical Statisticians from Petty to Farr" (Fitz-Patrick lectures); February 23 and 25, Dr. S. A. Henry, "The Health of the Factory Worker in War-time" (Milroy lectures); March 4, 9 and 11, Professor R. V. Christie, "Emphysema" (Goulstonian lectures); March 16 and 18, Dr. Geoffrey Evans, "Arterio-sclerotic Disease" (Lumleian lectures); March 23 and 25, Professor G. W. Pickering, "The Circulation in Arterial Hypertension" (Oliver-Sharpey lectures); May 25 and 27, Air-Commodore C. P. Symonds, "Flying Stress" (Croonian lectures); November 4, Dr. J. W. Brown, "The Interauricular Septal Defect" (Bradshaw lecture); November 16, Professor L. G. Parsons, "The Prevention of Neonatal Disease and Neonatal Death" (Charles West lecture).

THE statement on the incomes of chemists published in the issue of SCIENCE for January 15 was based on a survey of the committee on economic status of the American Chemical Society. This report was prepared by Andrew Fraser, Jr., who organized and administered the survey.

THE National Foundation Against Infantile Paralysis in the United States has offered, at the suggestion of President Roosevelt, to send experts to Argentina to assist in combating a current epidemic of the disease.

THE University of Buffalo has received a gift of securities with a present market value of $348,248 as a result of a trust agreement made by Jacob F. Schoellkopf, who died on September 8. The gift establishes the Jacob F. Schoellkopf trust, which the university may use for its "best interests." Mr. Schoellkopf gave the university $50,000 in 1920 and $50,000 in 1926, and in 1929 he and twenty-one other members of his family gave the university stocks which had a market value of $1,000,000.

THE W. K. Kellogg Foundation has provided funds for twenty fellowships in health education, each carrying a stipend of $100 monthly for 12 months plus tuition and leading to a master's degree in public health at the University of North Carolina, to be administered by the U. S. Public Health Service in Washington. Applications should be sent to the Surgeon General, U. S. Public Health Service, Washington, D. C., by March 1.

THE Wm. S. Merrell Company, pharmaceutical manufacturers of Cincinnati, has completed the construction of a new addition to its scientific laboratories in order to make additional space available for chemical and biological research.

DISCUSSION

WHAT PRICE GLORY?

DEATH notices of physicians are recorded each week in the *Journal* of the American Medical Association. The longest obituaries appear at the head of the column, the shortest ones at the end, while the intermediate notices are of regularly decreasing lengths.

Richard A. Rendich[1] reports that the average age of the first ten was 4.7 years less than that of the last ten. The analysis was based on tabulation of thirty successive issues of the Journal. Thus, "the life span of the physicians who attained position of prestige could be compared with that of those who appear to have lived under less stress among their patients."

Clarence A. Mills[2] in an article entitled "What Price Glory?", analyzed 1,036 notices appearing in the same column. He assumes that the number of printed lines in each obituary may be used as a rough measure of the subject's prominence or achievement. The mean age at death was found greater in two groups: those with most lines (21 or more) and those with least (2 lines). The intermediates, with from 6 to 15 lines, die earliest. Mills writes "the great seem not so inclined to die young or break down in the struggle as are the somewhat less successful; instead, their heritage appears more likely to be a ripe old age."

Statistics, being endowed with mathematical accuracy, may be considered infallible. Their interpretation may not be, and particularly so if the basic premises on which the statistics were developed are incorrect. This is reminiscent of the early days of pathology when the gross pathologist had great fun with the clinician, twitting him over his diagnostic errors. There was no one to correct the pathologist. With the advent of microscopic pathology this was changed and the gross pathologist found himself no longer infallible. Some of us still have occasion, now and then, to doubt the finality of statistical conclusions. The question is not of the accuracy of the mathematics but of the human element, the basic premises and the interpretation of the findings. This is especially true in certain problems of medicine and the social sciences which do not lend themselves well to statistical analysis.

The present subject serves as an excellent example. In discussing "What Price Glory?" one must ask, "What Glory?" The only glory that can be truly analyzed statistically is the number of lines devoted to each death. Any conclusion that goes farther is inferential. As a rule the more prominent a man is, the larger will be the number of lines. But, given two men of equal prominence or success, the one who lives longer is likely to have held more positions, joined more societies and received more tokens of recognition. In this case age enters as a factor. Or, take two men of equal ability, one of whom has been active in organized medicine. The larger number of offices held will make more lines. Here, then, politics enters. I realize also that statisticians have check methods by which they believe they can determine whether an analysis is significant. Sometimes I find myself wishing that the statistician, like the gross pathologist, had someone to check him.

My thesis is illustrated in the following death notices which appeared in the *Journal* of the American Medical Association for October 24, 1942, approximately the date of Mills's communication.

Carey Culbertson. Winnetka, Ill.; Northwestern University Medical School, Chicago, 1898; specialist certified by the American Board of Obstetrics and Gynecology, Inc.; member of the American Gynecological Society and Chicago Pathological Society; a founder and member of the Central Association of Obstetricians and Gynecologists; fellow of the American College of Surgeons; for many years clinical professor of obstetrics and gynecology at the Rush Medical College, Chicago, and in 1941, when the school was taken over by the University of Illinois College of Medicine, became professor of obstetrics and gynecology emeritus; served as a major in the medical corps of the U. S. Army during World War I; formerly member of the board of health of Chicago and medical inspector of the public schools; chief of the staff of gynecology at the Cook County Hospital, Chicago, from 1925 to 1937 and for many years attending gynecologist; attending obstetrician and gynecologist to the Presbyterian Hospital, Chicago, from 1908 to 1938; formerly consulting obstetrician to the Norwegian American Hospital, Chicago; member of the Chicago Historical Society, Institute of American Genealogy and the Oriental Institute of the University of Chicago; at one time abstract editor of Surgery, Gynecology and Obstetrics, editor of Gregorio Maranon's book "The Climacteric" and author of "Surgery of the Female Pelvis": aged 71; died October 9, in the Veterans Administration Facility, Downey, of pneumonia.

Regina Flood Keyes Roberts, Chefoo, China; University of Buffalo School of Medicine, 1896; formerly clinical instructor in obstetrics at her alma mater; at one time on the staffs of the Buffalo General and Erie County Hospitals, Buffalo; organized and was head of a base hospital in Salonika, Greece, during World War I; was decorated by the French, Serbian and Belgian governments; aged 72; died July 10, while aboard the S. S. Conte Verde of a ruptured gallbladder.

Having read these, one feels that one knows all that was important in the events of the first life. But don't you wish that you had been told a bit more

[1] *Jour.* Amer. Med. Assn., July 25, 1942, page 1041.
[2] SCIENCE, October 23, 1942, page 380.

about the thrills and the accomplishments of the little old lady in far-away China, who fought in the last war and was decorated by three governments?

Obituary notices of prominent people are often written on the basis of information available in "Who's Who in America." Applying the line test to "Who's Who" brings out some interesting figures. Henry Ford has 28 lines; Theodore Roosevelt, Jr., 49; C. F. Williams, Cincinnati, 50; William Fortune, of Indianapolis, 117. Franklin Delano Roosevelt rates only 35 lines.

In 1938 Lily Pons had 11 lines, while Shirley Temple had 22. In 1942 Miss Pons had 19, while Miss Temple had increased to 25. Miss Pons is gradually catching up. In 1938 Jack Benny had 10 lines, Fred Allen 4. The 1942 figures indicate waning popularity of the former with increasing fame of the latter, since Benny now has, 9, Allen 6. In 1938 Douglas Fairbanks had 21 lines, while his son had 26. Jerome Kern rates 53 lines against Fritz Kreisler's 19. E. Phillips Oppenheim has more than twice as many as Ernest Hemingway. One of Koussevitsky's associate directors has 30 lines against Koussevitsky's 26. Toscanini rates 22.

These are glaring discrepancies. There are many others. I realize that the statisticians might try to show that, taking the book as a whole, they are not of statistical significance. Inequalities do not show as much in "American Men of Science," since the data in all cases are much briefer. However, I do gather the impression from hasty perusal that if one is an M.D. one is likely to have a longer sketch. If this is so, we must add "profession" to "longevity" and "political affiliations" as a factor in determining the number of glory lines.

The purpose of the present communication is not to take issue with the conclusions of the two reports under discussion but to call attention to possible discrepancies between "statistical information" and "conclusions based on statistics."

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A NEED FOR MORE UNIFORM USAGE OF WORDS OF INDEFINITE MEANING

ON page 560 of SCIENCE, issue for December 18, 1942, Mr. Ackerman had a communication entitled "A Need for more Uniform Usage of Words of Indefinite Meaning." It seems to me that as soon as we assign mathematical values to the words which he mentioned they lose their meaning as "words." While at first thought the temptation is to agree with Mr. Ackerman, yet after a more careful consideration, it seems as though assigning definite mathematical values to these words were unnecessary and misleading. If one knows the approximate percentage of the occurrence of a phenomenon it is just as easy to use the numbers as words designating them. For example, it would be just as easy to say, "it occurred only one or two per cent. of the time" as it would be to say "it occurred very few times." We could just as easily say "it occurred anywhere from 10 to 25 per cent." as to say "it occurred frequently." Every one of course must agree that "all" can mean only 100 per cent., and that "about half" should mean from 45 to 55 per cent.

The use of such words when the approximate percentage is known might also be misleading. In discussing certain quantities, one invariably thinks of percentages, while in discussing others, numbers may be of greater importance than percentages. Take for example: in the observation of 100 phenomena, let us say one of them did not follow the particular law being investigated. We would then say that "seldom was the law disobeyed." Supposing only ten observations had been made and one did not agree with the general law, how should we express this in words? According to Mr. Ackerman, we would say "The law was frequently disobeyed." Was it?

It seems to me that the difficulty is not with the general meaning of such words as "seldom," "slightly," "frequently," etc., but rather with the men who use them. Since they are only used when the exact percentage or the exact number is unknown, I believe it would be folly to try to assign even approximate values to them.

May I suggest that we should learn to say "approximately 40 per cent. . . . " rather than "very many."

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AVIAN MALARIA

IN an article entitled, "The Occurrence of Intravascular Agglutinations in Avian Malaria," which appeared in the issue of SCIENCE of December 4, 1942, Dr. Arthur L. Lack, Jr., reported certain work done by him while an instructor in the department of anatomy in the University of Tennessee. The publication is not credited to the University of Tennessee, but footnotes acknowledging support of the work by the Tennessee Valley Authority through the University of Tennessee lead to the implication that these organizations were cognizant of the publication. Neither the Tennessee Valley Authority nor the University of Tennessee had an opportunity to review the report before it was published and do not assume responsibility for it.

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SCIENTIFIC BOOKS

DIFFERENTIAL FERTILITY

Group Differences in Urban Fertility. By CLYDE V. KISER. Baltimore: Williams and Wilkins Company. 296 pp. 1942. $2.50.

THIS is a study of differential fertility in urban communities based on data gathered in the National Health Survey, 1935–36. Although the data were intended primarily to throw light on the health of the population the abundance of the information on the social and economic status of the families and the report on births during the year preceding the survey made it possible to study fertility differentials both between and within certain classes of the population. Furthermore, the sample was carefully selected to secure representative populations. The results, therefore, are of great interest to all who are concerned with sources of population growth in the United States, although they relate primarily to urban populations.

It will not be possible in a brief review even to mention the methods employed to insure the accuracy of the results. It will suffice to say that in the reviewer's opinion these methods adequately guarded against biases which might easily creep into the use of such data.

When the population was classified into four large groups according to the occupation of the husband, the number of births per 1,000 wives (standardized for age) was as given in Section A of the accompanying table.

The points of chief interest here are the higher rate among the native whites in the professional than in the business group, the only slightly higher rates (except professional) among the foreign-born and the lower rates among the colored.

When education of the wife was used as the basis of the classification (see table, Section B) the rates show a steady increase for all groups as the amount of education decreased but the differences are not as large as might be expected. In these cities differential fertility is becoming less.

When income is made the basis of classification (see table, Section C) there is a steady rise in the birth rate as income decreases except in the $3,000–4,999 and $2,000–2,999 groups among native whites. Here there is a decline of one point at each successive decline in income, which is scarcely significant. But it may be significant that above the income level of $2,000 among native whites, there is no further decline in rate or it may merely mean that in 1934 (births of 1935) the higher income groups, $5,000 and over, felt less pressure to postpone births than the $2,000–5,000 groups.

	Native White	Foreign-born White	Colored
Section A Occupation of Husband			
Professional	94	86	79
Business	86	109	81
Skilled	100	111	85
Unskilled	115	122	86
Section B Education of Wife			
College	87	82	64
High School	91	108	85
7th–8th Grades	105	109	85
Under 7th Grade	118	125	87
Section C Family Income			
$5,000 and over	78	83*	45†
3,000–4,999	77		
2,000–2,999	76	90	
1,500–1,999	81	102	60
1,000–1,499	90	104	73
Under $1,000 and Total Relief	117	128	90
Nonrelief under $1,000	96	108	69
Total Relief	147	155	126

* $3,000 and over.
† $2,000 and over.

When occupational groups (native whites) are further divided according to education of wife there is a steady increase in the birth rate as education decreases in each occupational group. When these occupational groups are divided into income classes, there is, with minor exceptions, a rise in the birth rate of each occupational group as income decreases, but at the same income level there is either very little difference in birth rate between the several occupational groups or it decreases in proceeding from professional to unskilled until the income falls below $1,000 and here there is a steady rise as social status declines.

The fact that the birth rates noted above refer to married women only obscures the relative reproduction rates of these classes to some extent since higher social and economic status is associated with a smaller proportion married and with older marriage age. This is shown clearly in the net reproduction rates which show that where family incomes were over $3,000 there were only 42 per cent. of the children needed to maintain the population. This per cent. increased steadily as income decreased until at less than $1,000 it rose to 96 per cent. Where the wife had a college education there were only 52 per cent. of the needed children, but where she had less than seven grades of schooling, it rose to 97 per cent. In this

group of urban women, there was no social or economic group (except the relief families) that had a birth rate high enough to maintain itself and as a whole they would decline in numbers by 30 per cent. in a generation.

The small sample of the rural population studied like the urban showed in general an increase in the marital birth rate as social status declined and also as the amount of education decreased. But it had a significantly higher birth rate than the urban group, enough higher to insure the maintenance of its numbers with some to spare for increase.

This study is significant for the factual information it contains rather than for any changes found in the usual class, race and nativity differentials. To the reviewer the most interesting point in the study is that it adds to the accumulating evidence that differentials between the birth rates of social and economic classes are diminishing. This is probably taking place not through a rise in the birth rate of the more fortunate groups but through the further decline of that of the less fortunate groups. It is a sad commentary on our civilization that the people who have got most out of it economically, and in position, have less than half enough children to take their places in the next generation. Even if the birth rate in 1935 was somewhat below what might be considered normal it is still of great significance that those to whom our civilization has been kindest do not consider it a fit environment in which to bring up children; or is it that they are so absorbed in their own success that they have no time to consider the need for their participation in the future of our national life by taking part in reproduction? Such facts as are here adduced can not but arouse thoughts on the meaning of a civilization which sterilizes or nearly sterilizes those who generally believe themselves to be its most perfect fruit.

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SPECIAL ARTICLES

PURIFICATION AND PROPERTIES OF THE SECOND ANTIBACTERIAL SUBSTANCE PRODUCED BY PENICILLIUM NOTATUM[1,2]

IN an investigation begun in the laboratories of Dr. S. A. Waksman, New Jersey Agricultural Experiment Station, in the winter of 1940 and continued at the University of Pennsylvania, the observation was made that strains of *Penicillium notatum* produce an antibiotic substance different from penicillin. The properties of this second antibacterial substance, for which the name penatin has been proposed, have been discussed[3] and the cultural conditions for the production established.[4] Progress has been made in the purification of penatin, which, in its bacteriostatic power, not only surpasses the purest preparations of penicillin, but is also effective against bacteria which are not susceptible to any appreciable degree to the action of penicillin, notably some gram-negative organisms. Of 50 pathogenic and non-pathogenic organisms tested, none have been found which would resist the bacteriostatic action of penatin in dilutions of not less than 1:10 millions. The purest preparations obtained were bacteriostatic to certain organisms in even higher dilutions, for instance, 1:400 millions. Penatin is also bactericidal, but to a lesser degree. Table 1 shows the bacteriostatic action of penatin, which contrasts sharply with the range of action of penicillin.

TABLE 1

BACTERIOSTATIC ACTION OF PENATIN AGAINST VARIOUS PATHOGENIC AND NON-PATHOGENIC ORGANISMS

Test organism	Dilution 1 : millions						
	12.5	25	42	125	250	420	1250
Sarcina lutea	–	–	–	–	–	Tr	N
Gaffkya tetragena	–	–	–	–	–	I	N
N. catarrhalis	–	–	–	–	–	I	N
Staph. aureus	–	–	–	–	Tr	N	N
C. diphtheriae	–	–	–	I	N	N	N
Cl. histolyticum	–	–	–	I	N	N	N
Ps. aeruginosa	–	–	–	N	N	N	N
Eb. typhosa	–	–	–	N	N	N	N
B. anthracis	–	–	Tr	N	N	N	N
Br. melitensis	–	–	Tr	N	N	N	N
Br. abortus	–	–	Tr	N	N	N	N
S. paratyphi	–	–	I	N	N	N	N
D. pneumoniae, Type I ..	–	Tr	I	N	N	N	N
S. pyogenes (C203M) ..	–	Tr	N	N	N	N	N
Es. coli	–	I	N	N	N	N	N
Trichophyton interdigitale[5]	–	I	N	N	N	N	N

Conduct of the test: Penatin was incorporated in tryptose agar and the test organism streaked out. Readings after 48 hours at 28° or 37° respectively. – = no growth, Tr = trace of growth, I = inhibited growth, N = normal growth, similar to control.

While the addition of growth-stimulating substances, such as corn-steep liquor, yeast or malt extract, to the Czapek-Dox medium were found to be beneficial for the formation of penicillin, their presence will prevent the formation of penatin. It is further noteworthy that the particular strain of *Penicillium notatum* (PEN 2) found most active in the production of penatin was discovered years before

[1] From the Schools of Medicine and Veterinary Medicine, University of Pennsylvania.

[2] This investigation has been supported by the Thos. H. Dougherty, Jr., Fund, and by grants from the Department of Agriculture, Commonwealth of Pennsylvania.

[3] W. Kocholaty, *Jour. Bact.*, 44: 143, 1942.

[4] *Ibid.*, 44: 469, 1942.

[5] Krainsky's agar was used. Readings after 10 days at room temperature.

Fleming's discovery of the strain of *Penicillium notatum* which produces penicillin.

In contrast to penicillin, penatin is not extractable from the crude culture by the common organic solvents. Two ways of purification have been found. One is the precipitation of penatin with phosphotungstic acid (penicillin is not precipitated by this agent) which will form an acid-insoluble penatin-phosphotungstate. Because of losses in free penatin encountered in the decomposition of this compound, another method of purification was used. It consists in the adsorption of penatin on kaolin at pH 4, elution of the washed kaolin with pyridin or sodium phosphate at pH 6.3, and precipitation of the penatin by dioxane. The dioxane precipitate is dissolved in water and dried by the lyophilic method. Concentrated solutions of penatin in this state of purification are yellow. In dry preparation, penatin is a yellowish hygroscopic powder, completely soluble in water and stable for months. Penatin is sensitive to the action of alkalis, but more resistant to acids.

A single intravenous injection of 16.5 mg of penatin into a rabbit and a single intramuscular injection of 250 mg of penatin into a guinea pig were made without obvious ill effects. Furthermore, its action is not impeded in 90 per cent. serum. Further experiments on toxicity and antibacterial action *in vivo*, as well as some peculiarities of penatin, will be reported elsewhere.

WALTER KOCHOLATY

SOME CHEMICAL AND PHARMACOLOGICAL OBSERVATIONS ON "LOW NICOTINE" TOBACCO

THROUGH the kindness of Dr. W. D. Valleau, of the Kentucky Agricultural Station, we were supplied with sufficient "low nicotine" Kentucky burley tobacco to make certain chemical and pharmacological observations which appear of interest. The only previous report of similar studies is that of Wenusch and Maier[1] whose observations our present work confirms in general.

On chemical analysis, the leaf web of this tobacco was found to contain 0.13 per cent. nicotine and 0.27 per cent. nornicotine.[2] Cigarettes weighing one gram each were made of the granulated leaf web and the main stream smoke analyzed (excepting for nornicotine) by the methods described by Bradford, Harlow, Harlan and Hanmer.[3] The smoke from each cigarette contained 0.42 mg total volatile bases (calculated as ammonia) including 0.23 mg nicotine and 0.058 mg nornicotine.

The amount of nicotine is less than 10 per cent. of that found in the smoke of the average standard cigarette. The presence of nornicotine in the tobacco adds an unusual feature to these cigarettes, since this substance is not normally reported present in cigarette tobaccos. Wenusch[4] has stated that only a small amount of nornicotine is transferred into the smoke from material containing it. The data presented here indicate that the transfer is less than 4 per cent. compared to 29 per cent. for nicotine. The percentage transfer of nicotine from average standard cigarettes is about 22 per cent., the higher value obtained here representing a recognized tendency for low nicotine tobaccos to transfer a higher percentage of their nicotine content into the smoke.[3]

Solutions were prepared from the smoke of these cigarettes as well as from that of a standard brand of cigarettes by a method previously described[5] and studied pharmacologically. These solutions were so made that, calculated on the nicotine content of smoke, each ml contained 0.5 mg nicotine. When tested for their toxicity by intraperitoneal injection into white mice, the L. $D._{50}$ for the two solutions was identical and in accord with their calculated nicotine content. The failure of nornicotine to materially affect the result is due to its low percentage transfer in the smoke and to its toxicity being only half that of nicotine by the intraperitoneal mode of administration.[6] When these solutions were injected intraveneously into an anesthetized dog arranged for the recording of blood pressure, the blood pressure response was identical to that produced by a control solution of pure nicotine of similar nicotine content. The pressor potency of nornicotine is only one twelfth that of nicotine.[6]

A limited number of studies were made on the effect of smoking these low nicotine cigarettes on the blood pressure and pulse rate in man, using the method of standardized smoking described by Main.[7] The results of these preliminary tests showed that the smoke from the low nicotine cigarettes on an average produced effects comparable to those observed after the smoking of nicotine-free cigarettes,[7, 8] both types of cigarettes evoking circulatory responses, markedly less than those effected by ordinary cigarettes.

SUMMARY

Chemical and pharmacological tests have been carried out on a sample of "low nicotine" tobacco. Laboratory tests involving toxicological studies on mice

[1] Adolph Wenusch and Gerda Maier, *Munchen. Med. Wchnschr.*, 87: 1263, 1940.
[2] Methods of analysis to be published.
[3] J. A. Bradford, E. S. Harlow, W. R. Harlan and H. R. Hanmer, *Ind. and Eng. Chem.*, 29: 45, 1937.
[4] Adolph Wenusch, *Pharm. Zentralhalle*, 77: 141, 1936.
[5] H. B. Haag, *Jour. Lab. and Clin. Med.*, 25: 610, 1940.
[6] P. S. Larson and H. B. Haag, *J. Pharmacol. and Exper. Therap.*, in press.
[7] R. J. Main, *Proc. Soc. Exper. Biol. and Med.*, 48: 495, 1941.
[8] J. H. Weatherby, *Am. Heart Jour.*, 24: 17, 1942.

and blood pressure determinations in the dog showed that the toxic and vasopressor effects of the smoke from this tobacco was proportional to the amount of nicotine present and relatively independent of the nornicotine content of the tobacco. On man the smoke from these low nicotine cigarettes produced very much less pronounced effects on blood pressure and pulse rate than that produced by ordinary cigarettes. These results indicate that this type of tobacco is sufficiently low in nicotine to make it practically deserving of much further study.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

DRY STRIPPED REPLICAS FOR THE ELECTRON MICROSCOPE

THE use of the electron microscope to study the fine structure of the surface of etched metals or other materials has been shown to be a fairly simple process[1,2] when the direct replica method is used. A still simpler process than those previously described for removing the replica film has now been devised by the writer. It lends itself to a study of practically any flat surface which is free of re-entrant angles or other structure that might prevent the removal of the replica film. The method should be particularly adaptable in permitting the microscopist to make a comparison of identical structures as seen in the optical and electron microscopes.

The replica film of polyvinyl formal dissolved in dioxane is formed on the specimen in the manner previously described. A standard electron microscope, 200 mesh nickelscreen, is then centered above the region to be studied. This positioning process may be carried out with a jig which slips over the objective of the light microscope used for obtaining a photomicrograph. With the screen in place a bit of moist air is applied to the coated surface and immediately a piece of scotch tape is pressed into light contact with the screen and the surrounding film. Holding the scotch tape against the specimen, on one side of the positioned screen, the tape is held rigidly and lifted away from the surface. When this is done the replica leaves the specimen and will be found in contact with the under surface of the screen ready for mounting in the specimen holder of the electron microscope.

The scotch tape is easily removed from the mounting screen by placing the tape holding the screen in contact with a flat surface. The tape is then turned through 180°, a finger placed on the sticky surface and the tape slowly peeled from the surface until the edge of the screen becomes visible. A razor blade or similar thin flat object held against the screen prevents it from becoming bent as the tape is peeled away from it.

The entire process of replica formation, removal and mounting may be carried out in less than two minutes. Perhaps the most attractive feature of the process described is the fact that the specimen is not injured in any way. For example, from a specimen of 1.1 C Steel (used for developing the technique) at least fifty replicas have been obtained without injuring the surface in any way.

In preparing surfaces of metals for electronographic study it is important that the distance in elevation between high and low spots on the sample does not exceed 400–600 ÅU. To obtain this property and still have a uniform metallographic etch it was found that the standard solutions (such as Nital) should be diluted from four to ten fold, and applied with a swab.

Some evidence has been noted which indicates that conditioning metal surfaces with surface active molecules such as tricresyl phosphate and oleic acid greatly facilitates the removal of replicas. Not more than a monolayer is needed for this purpose. Excess molecules and other contaminations are readily removed by coating the specimen with a film three or four times thicker than that used for making replicas and peeling it off with scotch tape. This thicker film also affords excellent protection to the prepared surface against corroding vapors and moisture.

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[1] V. J. Schaefer and D. Harker, *Jour. App. Phys.*, 13: 427, July, 1942.
[2] V. J. Schaefer, *Phys. Rev.*, 62: 495, 1942.

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